

COMMISSIONER FOR PATENTS, Washington, D.C. 20231

Enclosed for filing is the patent application of Inventor(s):

**GODWIN DIRK ZWANENBURG****For: DEVICE FOR REGENERATING AN ION EXCHANGE CARTRIDGE****ENCLOSED ARE:**

- ☒ Associate Power of Attorney;  
☐ Information Disclosure Statement, Form PTO-1449 and copies of documents listed therein;  
☒ Preliminary Amendment;  
☒ Specification (7 Pages of Specification, Claims, & Abstract);  
☒ Declaration and Power of Attorney:  
 (1 Page of a ☐ fully executed ☒ unsigned Declaration);  
☒ Drawing (3 sheets of ☐ informal ☒ formal sheets);  
☒ Certified copy of EUROPEAN application Serial No. 99203248.2;  
☒ Authorization Pursuant to 37 CFR 1.136(a)(3);  
☒ Other: Citation of Related Cases;  
☐ Assignment to

## FEE COMPUTATION

CLAIMS AS FILED				
FOR	NUMBER FILED	NUMBER EXTRA	RATE	BASIC FEE - \$710.00
Total Claims	8 - 20 =	0	X \$18 =	0.00
Independent Claims	1 - 3 =	0	X \$80 =	0.00
Multiple Dependent Claims, if any			\$270 =	0.00
TOTAL FILING FEE . . . . .			=	\$710.00

**Please charge Deposit Account No. 14-1270 in the amount of the total filing fee indicated above, plus any deficiencies. The Commissioner is also hereby authorized to charge any other fees which may be required, except the issue fee, or credit any overpayment to Account No. 14-1270.**

*Ernestine C. Bartlett*  
 Ernestine C. Bartlett, Reg. 22,861  
 Attorney  
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## CERTIFICATE OF MAILING

Express Mail Mailing Label No EL458218435US

Date of Deposit **October 3, 2000**

I hereby certify that this paper and fee is being deposited with the  
 United States Postal Service "Express Mail Post Office to Addressee"  
 service under 37 CFR 1.10 on the date indicated above and is addressed  
 to the Commissioner for Patents, Washington, D.C. 20231

Elissa DeLuccy

Name

*Elissa De Luccy*  
 Signature

Send correspondence and papers to Corporate Patent Counsel  
 U.S. Philips Corporation, 580 White Plains Road, Tarrytown, New York 10591

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Atty. Docket

GODWIN DIRK ZWANENBURG

PHN 17,665

Filed: CONCURRENTLY

DEVICE FOR REGENERATING AN ION EXCHANGE CARTRIDGE

Commissioner for Patents, Washington, D.C. 20231

AUTHORIZATION PURSUANT TO 37 CFR §1.136(a)(3)  
AND TO CHARGE DEPOSIT ACCOUNT

Sir:

The Commissioner is hereby requested and authorized to treat any concurrent or future reply in this application requiring a petition for extension of time for its timely submission, as incorporating a petition for extension of time for the appropriate length of time.

Please charge any additional fees which may now or in the future be required in this application, including extension of time fees, but excluding the issue fee unless explicitly requested to do so, and credit any overpayment, to Deposit Account No. 14-1270.

Respectfully submitted,

By *Ernestine C. Bartlett*  
Ernestine C. Bartlett, #22,861  
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(914) 333-9640



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Atty. Docket

GODWIN DIRK ZWANENBURG

PHN 17,665

Filed: CONCURRENTLY

# DEVICE FOR REGENERATING AN ION EXCHANGE CARTRIDGE

Commissioner for Patents, Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Prior to calculation of the filing fee and examination, please amend the above-identified application as follows:

IN THE SPECIFICATION

Page 1, before line 1, insert the following heading:

--BACKGROUND OF THE INVENTION--;

Page 1, before line 17, insert the following heading:

--SUMMARY OF THE INVENTION--;

Page 2, before line 33, insert the following heading:

--BRIEF DESCRIPTION OF THE DRAWINGS--;

Page 3, before line 7, insert the following heading:

--DESCRIPTION OF THE PREFERRED EMBODIMENTS--.

IN THE CLAIMS

Please amend the claims as follows:

Claim 3, line 1, delete "or 2".

Claim 5, line 1, delete "or 4".

## IN THE ABSTRACT

Page 7, before line 1, delete in its entirety and substitute the

following heading: --ABSTRACT OF THE DISCLOSURE--;

line 14, delete "Fig. 2".

REMARKS

This Preliminary Amendment is submitted to place the application in proper U.S. format. Entry is respectfully requested.

Respectfully submitted,

By Ernestine C. Bartlett  
Ernestine C. Bartlett, #22,861  
Attorney  
(914) 333-9640

Device for regenerating an ion exchange cartridge.

The invention relates to a device for regenerating an ion exchange cartridge which is provided with an inlet and an outlet.

5 Tap water is heated in domestic appliances such as steam irons, coffee makers and electric kettles. A quantity of  $\text{CaCO}_3$  and  $\text{MgCO}_3$  is deposited in the heating process, depending on the hardness of the water. The deposit thus formed is referred to as scale. A scale deposit gives rise to inter alia an impaired heat transfer and choking-up of water duct systems, and in the end to a premature failure of the domestic appliance. To counteract scale  
10 depositions, it is known, for example in electric irons, to use so-called anti-scale cassettes or cartridges. Such cartridges usually contain a resin which binds the alkaline earth metal ions among them  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$ , but also, for example,  $\text{CO}_3^{2-}$ , when coming in to contact with the water, so that no scale is formed. These cartridges are to be replaced with fresh cartridges from time to time, depending on the hardness of the water.

15 It is an object of the invention to provide a device with which the user of the domestic appliance him/herself can regenerate the cassette or cartridge in a simple manner, i.e. with which the alkaline earth metal ions can be removed from the cartridge, so that the  
20 cartridge can be re-used and need not be discarded.

The device according to the invention is for this purpose characterized in that the device is provided with a reservoir for the accommodation of a solution in which alkali  
25 metal ions and chloride ions are present, which reservoir is provided with an outlet to which the inlet of the ion exchange cartridge can be connected. The user takes the ion exchange cartridge from the domestic appliance and connects it with its inlet to the outlet of the reservoir of the regeneration device. Then the reservoir is filled with a solution in which alkali metal ions and chloride ions are present. After the reservoir has been filled, the solution

(or brine) flows into the ion exchange cartridge, with the result that the alkaline earth metal ions from the resin of the ion exchange cartridge are replaced by the alkali metal ions of the solution. Such a solution may consist, for example, of water in which a quantity of ordinary salt (NaCl) has been dissolved. The required quantity of salt, equal to the product of the  
5 volume (L) and the concentration (g/L), must be sufficient. This obviously depends on the size of the cartridge. The solution flowing from the cartridge and the reservoir may be caught, for example, in a kitchen sink. The regeneration device is a comparatively simple tool by means of which a user him/herself can make the cartridge ready for use again. Any  
10 (bi)carbonate and sulfate (possibly sulfite) ions present in the ion exchange cartridge, such as  $\text{CO}_3^{2-}$  or  $\text{HCO}_3^-$  and  $\text{SO}_4^{2-}$  or  $\text{SO}_3^{2-}$ , are exchanged with the  $\text{Cl}^-$  ions from the salt solution at the same time. It may be noted that the regeneration process is known per se from industrial applications.

A preferred embodiment of the device is characterized in that the device is provided with a chamber in which the ion exchange cartridge can be placed, which chamber  
15 is provided with an inlet and an outlet, said inlet of the chamber being connected to the outlet of the reservoir, while said inlet and outlet of the chamber are coupled to the inlet and outlet, respectively, of the cartridge when a cartridge is inserted. The chamber facilitates the placement of the cartridge in the device.

A further preferred embodiment of the device is characterized in that a  
20 restriction is present in the flow path of the solution situated between the outlet of the reservoir and the outlet of the chamber. The flow velocity of the solution through the cartridge can be adjusted thereby such that an optimum regeneration rate is obtained. The restriction may be, for example, a spring-loaded non-return valve.

A yet further embodiment is characterized in that the outlet of the reservoir  
25 lies at a higher level than the outlet of the chamber in the operational condition of the device. The reservoir will empty itself completely under the influence of the hydrostatic pressure.

In yet another embodiment, a filter is present in the flow path of the solution situated between the outlet of the reservoir and the inlet of the chamber. This prevents any impurities, which could adversely affect the operation of the ion exchange cartridge, from  
30 entering this cartridge.

The invention will now be explained in more detail below with reference to an embodiment shown in a drawing, in which

Fig. 1 is a perspective view of the device according to the invention,  
Fig. 2 is a cross-section taken on the line II-II of the device of Fig. 1,  
Fig. 3 is a cross-section taken on the line III-III of the device of Fig. 1, and  
Fig. 4 is a cross-sectional view of the ion exchange cartridge.

5

As is apparent from the Figures, the regeneration device comprises a housing 1 which is substantially formed by a reservoir 2. The housing further has a chamber 3 whose upper side 4 is open. The bottom 5 of the chamber has an inlet 6 (Fig. 2) and an outlet 7 (Fig. 10 3). The bottom 8 of the reservoir 2 has a recessed portion 9 in which an outlet 10 is present. A filter 11 may be provided in the recessed portion 9. The outlet 10 is connected to the inlet 6 of the chamber 3, for example by means of a connecting tube 12, if necessary by means of a coupling piece 13. The outlet 7 of the chamber 3 may be provided with a discharge tube 14, possibly by means of a coupling piece 15. An ion exchange cartridge 16 has a housing 17 15 which is closed by a cover 18 at its upper side. The bottom 19 (see Fig. 4) of the housing 17 is provided with an inlet 20 and an outlet 21. The outlet 21 has a pipe 22 which stands up vertically in the housing 17 to just under the cover 18. The cartridge contains a resin 23. The ion exchange cartridge 16 can be placed in the chamber 3 of the device, such that the inlet 20 and the outlet 21 of the cartridge automatically connect to the inlet 6 and the outlet 7, 20 respectively, of the chamber 3, possibly with the aid of respective sealing rings 24 and 25.

The operation of the regeneration device is explained below. When the ion exchange cartridge 16 appears to be saturated, i.e. the resin has absorbed so many alkaline earth metal ions that the water in the domestic appliance can no longer be adequately descaled, the cartridge is taken from the domestic appliance and placed in the chamber 3 of 25 the regeneration device. The device is placed near the edge of the kitchen sink such that the discharge tube 14 is suspended in the sink. The reservoir 2 is then filled with ordinary tap water in which a quantity of kitchen salt (NaCl) has been dissolved. One liter of water with 10% by weight of NaCl is sufficient for most cartridges. The salt solution 26 will flow from the reservoir 2 through the filter 11 and the tube 12 to the resin 23 in the cartridge 16, and 30 from there through the discharge tube 14 into the sink under the influence of gravity. The alkaline earth metal ions such as  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  ions, are replaced with  $\text{Na}^+$  ions from the salt solution in the resin. At the same time, the  $\text{CO}_3^{2-}$  ( $\text{HCO}_3^-$ ) and  $\text{SO}_4^{2-}$  ( $\text{SO}_3^{2-}$ ) ions are replaced with  $\text{Cl}^-$  ions from the salt solution. After the cartridge has been flushed with the salt solution, it can be returned to the domestic appliance again (for example, an electric iron). The flow of

the salt solution may be limited, or possibly controlled, by a restriction, for example a spring-loaded valve 27. A filter 11 at the outlet 10 of the reservoir 2 prevents any impurities from entering the cartridge 16. The outlet 10 of the reservoir 2 lies at a higher level than the outlet 7 of the chamber 3. The result of this is that the entire contents of the reservoir 2 will flow through the cartridge under the influence of the hydrostatic pressure. The pipe 22 in the cartridge 16 ensures that all resin 23 in the cartridge is effectively flushed with the salt solution 26.



## CLAIMS:

1. A device for regenerating an ion exchange cartridge (16) which is provided with an inlet (20) and an outlet (21), characterized in that the device is provided with a reservoir (2) for the accommodation of a solution (26) in which alkali metal ions and chloride ions are present, which reservoir is provided with an outlet (10) to which the inlet (20) of the ion exchange cartridge (16) can be connected.

2. A device as claimed in claim 1, characterized in that the device is provided with a chamber (3) in which the ion exchange cartridge (16) can be placed, which chamber is provided with an inlet (6) and an outlet (7), said inlet (6) of the chamber being connected to the outlet (10) of the reservoir, while said inlet (6) and outlet (7) of the chamber are coupled to the inlet (20) and outlet (21), respectively, of the cartridge when a cartridge is inserted.

3. A device as claimed in claim 1 or 2, characterized in that a restriction (27) is present in the flow path of the solution situated between the outlet (10) of the reservoir (2) and the outlet (7) of the chamber (3).

4. A device as claimed in claim 3, characterized in that the restriction (27) is present in the inlet (6) of the chamber (3).

5. A device as claimed in claim 3 or 4, characterized in that the restriction (27) is provided with a spring-loaded non-return valve.

6. A device as claimed in claim 2, characterized in that the outlet (10) of the reservoir (2) lies at a higher level than the outlet (7) of the chamber (3) in the operational condition of the device.

7. A device as claimed in claim 2, characterized in that a filter (11) is present in the flow path of the solution situated between the outlet (10) of the reservoir (2) and the inlet (6) of the chamber (3).

8. A device as claimed in claim 2, characterized in that the outlet (7) of the chamber (3) is provided with a discharge tube (14).

## ABSTRACT:

The invention relates to a device for regenerating an ion exchange cartridge. In household appliances with an electric heating element for heating water, such as irons, coffee makers, and electric water kettles, deposition of scale is prevented by using an ion exchange cartridge (16) comprising a resin (23) which binds alkaline earth metal ions such as  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$ , but also negative ions such as  $\text{SO}_4^{2-}$  and  $\text{CO}_3^{2-}$  ions. The device is a simple tool in which the cartridge can be inserted for regeneration. The device comprises a reservoir (2) with an outlet (10) to which an inlet (6) of the cartridge can be coupled. By filling the reservoir with a brine, for example 1 l of water with 10% by weight of NaCl, said brine will flow through the cartridge replacing the alkaline earth metal ions, carbonate ions, and sulfate ions in the resin with the alkali metal ions ( $\text{Na}^+$ ) and the chloride ions ( $\text{Cl}^-$ ) of the brine. The brine can be easily drained into a sink.

Fig. 2

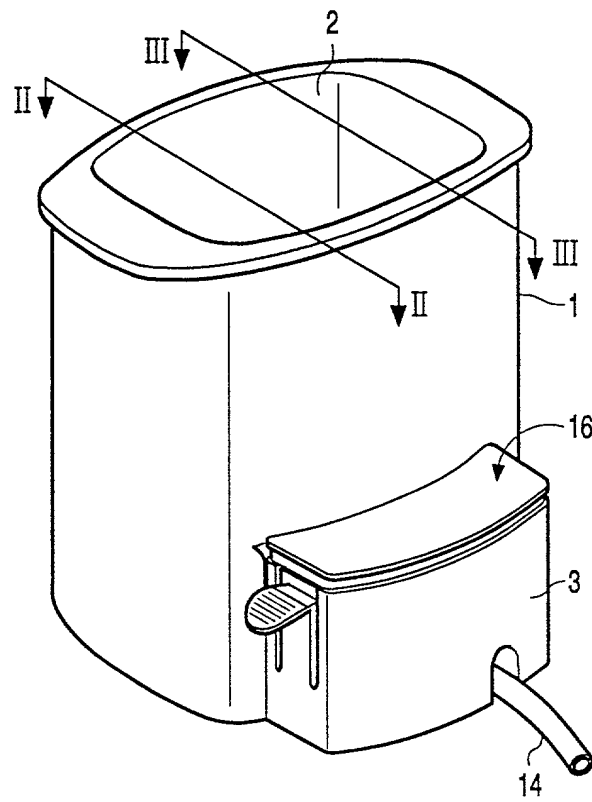


FIG. 1

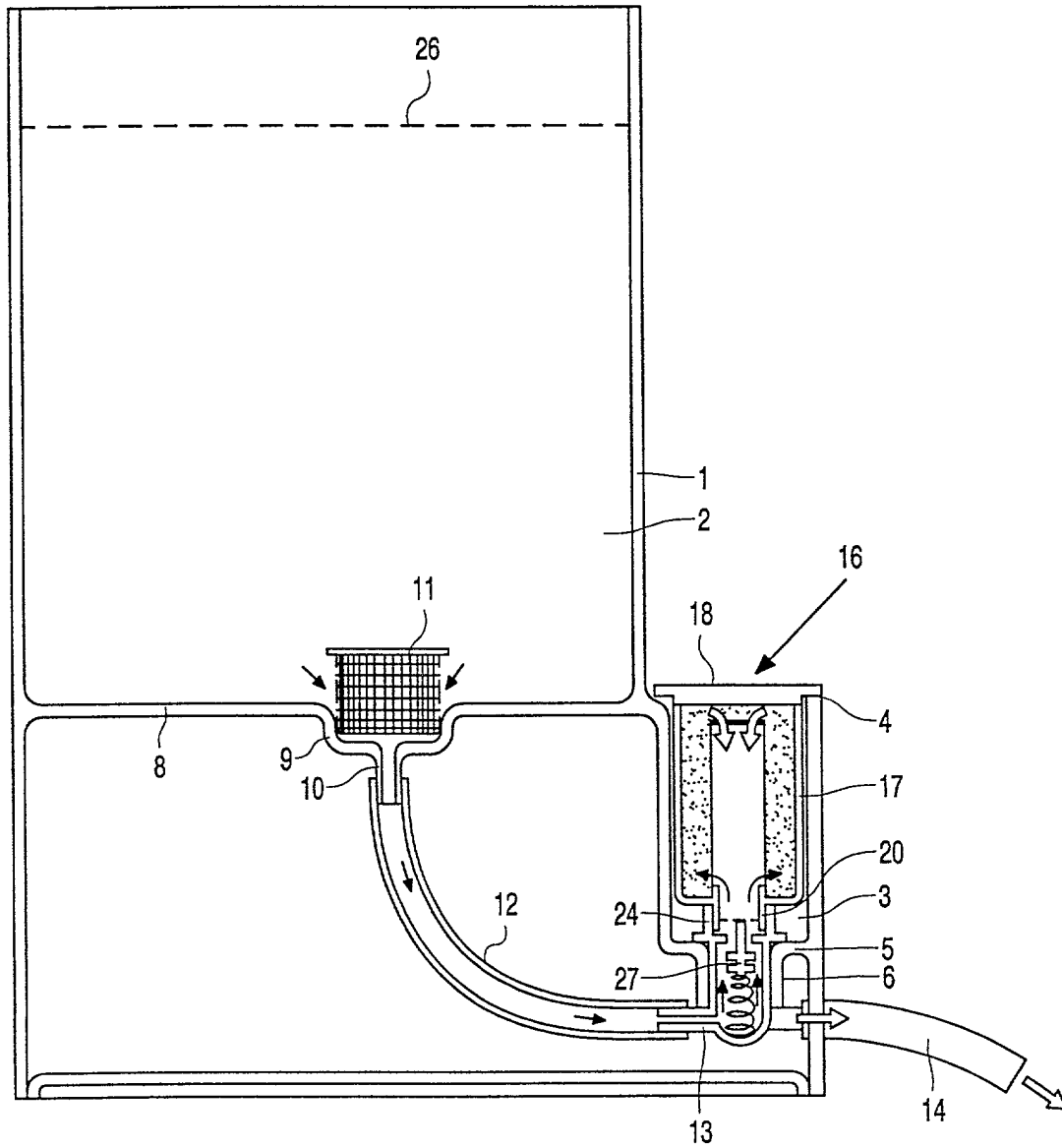


FIG. 2

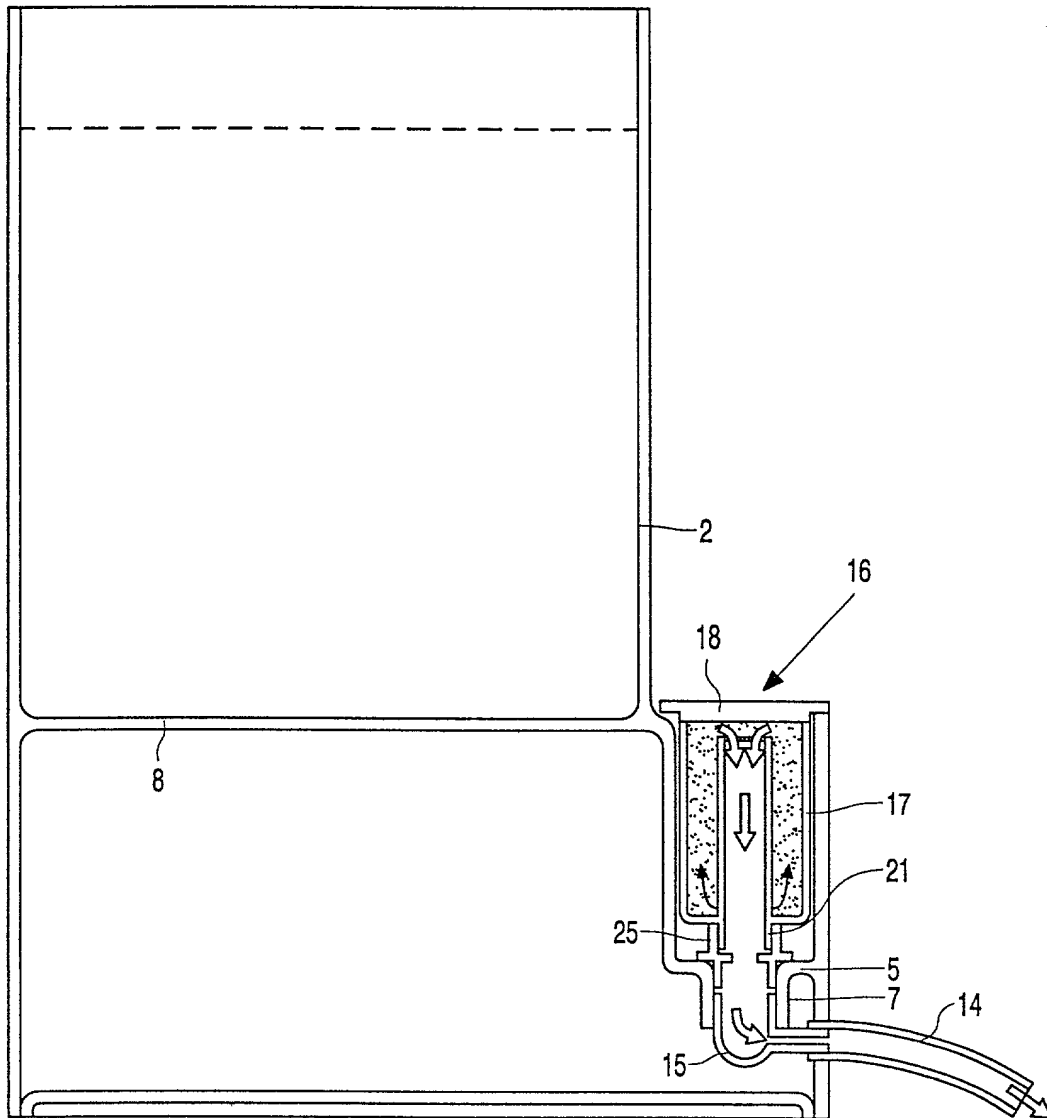


FIG. 3

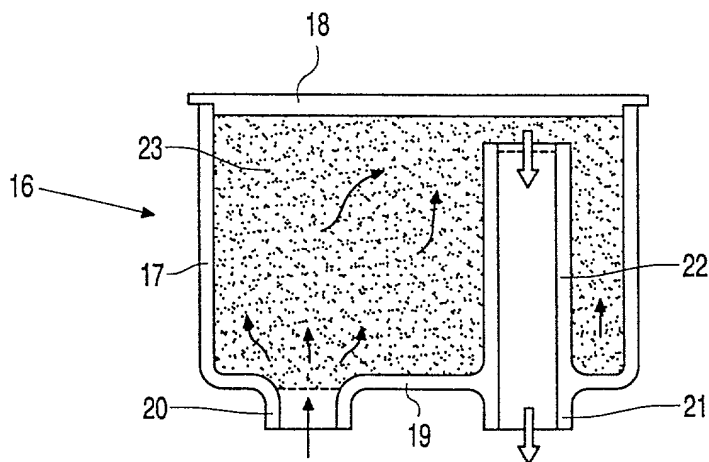


FIG. 4

# DECLARATION and POWER OF ATTORNEY

ATTORNEY'S DOCKET NO.:  
**PHN 17.665**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

**"Device for regenerating an ion exchange cartridge"**

the specification of which (check one)

☐ is attached hereto.

☐ was filed on \_\_\_\_\_ as Application Serial No. \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by the amendment(s) referred to above.

I acknowledge the duty to disclose information which is material to patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

PRIOR FOREIGN APPLICATION(S)

COUNTRY	APP. NUMBER	DATE OF FILING (DATE, MONTH, YEAR)	PRIORITY CLAIMED UNDER 35 U.S.C. 119
Europe	99203248.2	5 October 1999	YES

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35 United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

PRIOR UNITED STATES APPLICATION(S)

APPLICATION SERIAL NUMBER	FILING DATE	STATUS (PATENTED, PENDING, ABANDONED)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

**POWER OF ATTORNEY:** As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

Jack E. Haken, Reg. No. 26,902  
Michael E. Marion, Reg. No. 34,266  
Edward M. Blocker, Reg. No. 30,245

SEND CORRESPONDENCE TO: Corporate Patent Counsel; U.S. Philips Corporation; 580 white Plains Road; Tarrytown, NY 10591	DIRECT TELEPHONE CALLS TO: (name and telephone No.) (914) 332-0222
------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------

Dated:		Inventor's Signature:		
Full Name of in Inventor	Last Name <b>ZWANENBURG</b>	First Name <b>Godwin Dirk</b>	Middle Name	
Residence & Citizenship	City <b>Eindhoven</b>	State of Foreign Country <b>The Netherlands</b>	Country of Citizenship <b>The Netherlands</b>	
Post Office Address	Street <b>Prof. Holstlaan 6</b>	City <b>5656 AA Eindhoven</b>	State of Country <b>The Netherlands</b>	Zip Code

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
In re Application of Atty. Docket

GODWIN DIRK ZWANENBURG PHN 17,665

Filed: CONCURRENTLY

DEVICE FOR REGENERATING AN ION EXCHANGE CARTRIDGE

Commissioner for Patents, Washington, D.C. 20231

APPOINTMENT OF ASSOCIATES

Sir:

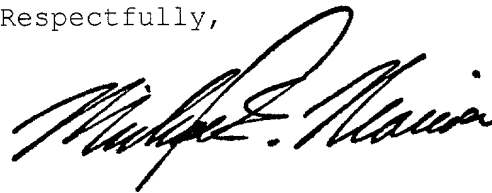
The undersigned Attorney of Record hereby revokes all prior appointments (if any) of Associate Attorney(s) or Agent(s) in the above-captioned case and appoints:

**ERNESTINE C. BARTLETT** (Registration No. 22,861)

c/o U.S. PHILIPS CORPORATION, Intellectual Property Department, 580 White Plains Road, Tarrytown, New York 10591, his Associate Attorney(s)/Agent(s) with all the usual powers to prosecute the above-identified application and any division or continuation thereof, to make alterations and amendments therein, and to transact all business in the Patent and Trademark Office connected therewith.

ALL CORRESPONDENCE CONCERNING THIS APPLICATION AND THE LETTERS PATENT WHEN GRANTED SHOULD BE ADDRESSED TO THE UNDERSIGNED ATTORNEY OF RECORD.

Respectfully,



Michael E. Marion, Reg. 32,266  
Attorney of Record

Dated at Tarrytown, New York  
on October 2, 2000.